

Commissioner of Patents
Serial No. 10/763,785
Response Date September 28, 2005
Reply to Office Action dated August 2, 2005
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AMENDMENTS TO THE SPECIFICATION

Please amend the paragraph appearing at lines 18-19 on page 3 as set forth below.

Additions to the specification are shown in underlined text and deletions to the text are shown in strikethrough text.

Figure 4 is a cross sectional side view of the preferred embodiment of the present invention taken along lines 5-5 in ~~Figure 4~~Figure 3 showing the light distribution produced by the present invention.

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Please amend the paragraph appearing at lines 5-16 on page 5 as set forth below. Additions to the specification are shown in underlined text and deletions from the specification are shown in strikethrough text.

Positioned behind the LED 10 and also centered on the optical axis of the LED is a circular annular double bounce mirror 40. With reference to ~~Figure 4~~ Figure 5, it can be seen that the circular annular double bounce mirror 40 comprises a first circular annular mirror 42 which in cross section has a flat reflecting surface 44 which is angled at an angle "a" that is 45° as measured from the optical axis 16. The circular annular double bounce mirror 40 also comprises a second circular annular mirror 46 which in cross section has a flat mirror surface 48 that is aligned at an angle of 90° with respect to the flat mirror surface 44. The circular annular mirror 42 has a first interior circular ~~edgesurface~~ edge 50 with a first exterior edge 82. First interior circular edge 50 ~~which~~ defines a circular opening 52 aligned around the optical axis 16. The circular annular mirror 42 also has a second exterior circular ~~edgesurface~~ edge 58 and a second interior edge 84 joined to the first exterior edge 82. Second exterior circular edge 58 ~~that~~ extends entirely around the perimeter of the circular annular double bounce mirror 40. Mirror 42 has two reflecting surfaces 44 and 48 oriented 90° with respect to one another and which are joined along an edge 56.

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Please amend the paragraphs appearing at lines 1-24 on page 6 and 1-2 on page 7 as set forth below. Deletions from the specification are shown in strikethrough text.

The aperture 38 in parabolic reflector 36 allows a cone of light having a conical angle of "b" to pass through the aperture 38 and impinge upon the flat surface 32 of condensing lens 30. The combination of the flat surface 32 and the curve surface 34 of lens 30 are configured to culminate the cone of light passing through aperture 38 into a beam of light parallel to the optical axis 16 as shown by the arrows 70 in Figure 4~~Figure 5~~. The conical angle "b" may typically be between 30 and 50 degrees as measured from the optical axis. Angle "b" is a function of the diameter of condensing lens 20 and the diameter of opening 38 in parabolic reflector 36. These diameters can be varied to allow as broad a cone of light that can be effectively collimated by lens 20 to be passed through aperture 38.

Similarly, a toroid of light from LED 10 strikes the curve surface 64 of parabolic reflector 36. That toroid of light can have a toroidal angle "c" the difference of between about 30° to about 90° (i.e. 60°) as measured from the optical axis to between the difference about 50° to 90° (i.e. 40°) as measured from the optical axis depending on the conical angle "b" of the cone of light passing through opening 38. That toroid of light is reflected downwardly in a collimated annular beam of light onto flat mirror surface 44 which, in turn, directs the light 90 degrees across to the flat surface 48 of second annular circular mirror 46 which, in turns, reflects the light 90 degrees in a direction parallel to the optical axis 16 as illustrated by the arrows 72 in Figure 4~~Figure 5~~. Thus, the circular annular double bounce mirror redirects the light by 180°.

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Because the circular edge of condensing lens 30 essentially coincides with the circular junction 56 of surfaces 44 and 48 of annular mirror 42 because the diameters are substantially the same, the light reflected by the circular annular double bounce mirror forms an annular beam which passes by the edge of circular condensing lens 30 and blends with the light collimated by condensing lens 20. As can be seen by Figure 4~~Figure 5~~, substantially all of the hemispherical pattern of light distributed by the Lambertian LED 10 is effectively culminated into a beam of light parallel to the optical axis 16 as is depicted by the arrows 70 and 72.

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Please amend the paragraph appearing at lines 3-8 on page 7 as set forth below. Additions to the specification are shown in underlined text and deletions from the specification are shown in strikethrough text.

While elements of the preferred embodiment illustrated in Figures 3-4 are shown floating without visible support, it should be understood by one of ordinary skill in the art that appropriate structural supports such as a lens holder~~-70~~ may be supplied to support the various elements of the system. It should also be expressly understood that various modifications, alterations or changes may be made to the preferred embodiment illustrated above without departing from the spirit and scope of the present invention as defined in the appended claims.